Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	
Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services	**CC Docket No. 92-297**

JOINT REPLY COMMENTS OF MOTOROLA SATELLITE COMMUNICATIONS, INC. AND IRIDIUM, INC.

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SUMMARY

Motorola Satellite Communications, Inc. and Iridium, Inc. (collectively "Motorola") hereby submit their Joint Reply Comments in response to the Comments filed in the above-captioned proceeding. As is clear from its initial Comments, Motorola strongly supports the general framework of the Commission's proposed band segmentation plan. Motorola stresses again that the Ka-band plan strikes a delicate balance among several conflicting interests and substantially accommodates a variety of both satellite and terrestrial services, all of which offer significant public benefits. The proposed plan is certainly not optimal for Motorola; different plans would accommodate Motorola's needs -- including the uninhibited operation of the all-important feeder links for the IRIDIUM® System -- more comfortably than the proposed plan. However, Motorola has consistently recognized the interests of other parties and therefore considers the general contours of the proposed plan as a very reasonable compromise satisfying as many parties as possible to the greatest extent possible. While there are alternatives that have been proposed which clearly are more favorable to other parties (*e.g.*, the allocation of 1000 MHz to the Local Multipoint Distribution Service ("LMDS") without any restriction on subscriber-to-hub links in even a small part of that spectrum), such alternatives would significantly impair the operation of the IRIDIUM® System and thus would be unacceptable to Motorola.

The delicate balance struck by the NPRM was predicated, in substantial part, on an agreement reached among principal proponents of both satellite and LMDS services.[1/] By means of reciprocal concessions on the part of all parties, including substantial concessions made by Motorola, the NRMC Agreement achieved a precise

1/ See Views of the NRMC Members Supporting Motorola-Suite 12/CVNY Rule Proposal in the Form of Their Version of Section VI To Report of Working Group 2 (September 23, 1994) ("NRMC Agreement" or "Motorola-LMDS Agreement"). These views were subscribed to, among others, by Motorola, Suite 12/CVNY, GHz Equipment Company, Bell Atlantic, Texas Instruments and a number of public interest parties.

and carefully delineated approach for sharing between LMDS and the IRIDIUM® feeder links. Unfortunately, some of the LMDS parties to the NRMC Agreement, most notably Texas Instruments ("TI"), would now like to deviate from its terms, and ask the Commission to deliver to them a windfall, by removing the restriction on subscriber traffic in the 150 MHz of shared LMDS/MSS feeder link spectrum. This restriction is an essential part of the NRMC Agreement, and its removal would cause Motorola to retract its support for LMDS-MSS feeder link sharing. Motorola was not convinced at the time it entered into the Agreement, and is certainly not convinced now, that sharing between upward-pointing LMDS subscriber links and MSS feeder links is possible. The "items" half-articulated by TI as "facilitating" such sharing are either impossible to implement or insufficient to make sharing possible.

With respect to accommodating a second MSS system in the 29.1-29.5 GHz band, TRW's own sharing analysis, if gauged against the appropriate short-term interference criterion for the IRIDIUM® System, confirms Motorola's position that such sharing is not feasible. Even if sharing were feasible, Motorola (as essentially recognized by TRW) would still need the flexibility of choosing eight locations as earth station complex sites, even though it currently plans to use no more than six of those locations.

With respect to sharing between MSS feeder links and geostationary Fixed-Satellite Service operators ("GSO FSS"), Motorola is pleased to find that the technical analysis submitted by Hughes Communications Galaxy, Inc. ("Hughes") reaches essentially the same conclusion as Motorola's analysis -- that sharing is extremely problematic in the absence of significant constraints. This conclusion militates in favor of the adoption of the constraints recommended by Motorola in its Comments, namely a prohibition on ubiquitous VSAT terminals and a restriction of the FSS use of the shared spectrum to a limited number of larger terminals well beyond the the eight feeder link sites selected by Motorola. The solution recommended by Hughes

-- relegating the IRIDIUM® uplinks to reverse band working -- would be prohibitively expensive and would necessitate substantial redesign and reengineering, resulting in substantial delays for the operation of the IRIDIUM® System.

Finally, Motorola vehemently opposes Hughes' suggestion that the Commission abandon its proposal not to auction MSS feeder link spectrum. The Commission's proposal is anchored in the clear meaning of the competitive bidding provisions of the Communications Act, and in the specific finding of the Commission that intermediate links should not be auctioned

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JOINT REPLY COMMENTS OF MOTOROLA SATELLITE COMMUNICATIONS, INC. AND IRIDIUM, INC.

I. INTRODUCTION

Motorola Satellite Communications, Inc. and Iridium, Inc.[1/] hereby submit their Joint Reply Comments in response to the Comments filed in the above-captioned proceeding. Motorola supports the Commission's band segmentation plan, with only minor modifications. Motorola emphasizes that this plan carefully balances the conflicting interests of several parties and substantially accommodates a variety of satellite and terrestrial services, all of which offer significant public benefits. Indeed, Motorola stresses that it is precisely because the Commission's plan represents such a

1/ In this pleading, Motorola Satellite Communications, Inc. and Iridium, Inc. will be collectively referred to as "Motorola."

delicate balance -- a balance based on reciprocal concessions -- that significant departures from the plan might completely overturn existing support. Motorola thus strongly opposes any suggestion that the Commission deviate from the plan, and notes, moreover, that those commenters who make such suggestions do not provide the technical basis necessary to support their positions.

Motorola's interest in the Ka-band is three-fold. First, the use of the band is essential for the feeder links of the IRIDIUM® System, whose first satellites will be ready for launch next summer. Accommodating these feeder links is necessary to permit the timely launch and operation of the first global non-GSO MSS satellite system.

Second, Motorola has recently submitted an application to construct, launch and operate a constellation of four geostationary orbit satellites in the Fixed-Satellite Service in the Ka-band.[2/] This system will provide broadband domestic and international services to the United States, Canada, Mexico and most of Central and South America.

Third, given its interests in the international satellite market, Motorola continues to be deeply concerned about the potential negative affects of the Commission's proposal to auction spectrum on its efforts to gain access to foreign markets.

2/ Iridium, Inc. does not share this interest

II. BAND SEGMENTATION PLAN AND SHARING RULES

A. The Prohibition On LMDS Subscriber-To-Hub Links In The Shared Feeder Link/LMDS Spectrum Is A Reasonable Restriction That Is Absolutely Essential To Safeguard The Operation Of MSS Feeder Links

Motorola reiterates its strong support for the Commission's proposal to adopt the prohibition on subscriber-to-hub LMDS links in the shared MSS feeder link/LMDS spectrum (29.1-29.25 GHz). This proposal is an essential component of the agreement reached between Motorola and the LMDS interests, including CellularVision and Texas Instruments, in the LMDS/FSS 28 GHz negotiated rulemaking. As noted in its Comments, Motorola sought and obtained the agreement of the LMDS interests based on sound technical and practical concerns and in exchange for reciprocal concessions made by Motorola. Texas Instruments ("TI") and others now claim that this restriction on subscriber transmissions is both unnecessary and overly burdensome.[3/] To the contrary, such a restriction is absolutely essential to the interference-free feeder link operations of the IRIDIUM® System. Moreover, it is a reasonable restriction which, while protecting MSS feeder link operations, also leaves LMDS licensees with 850 MHz of unfettered spectrum. In short, the prohibition on subscriber-to-hub transmissions in the 150 MHz of shared spectrum is a key ingredient for Motorola's support for the NRMC Agreement and the Commission's proposed band plan.

1. The Commission Should Not Countenance TI's Belated Efforts To Renege On The NRMC Agreement

The Commission has and should accord substantial weight to the NRMC Agreement between Motorola and the LMDS proponents in developing MSS-LMDS

3/ Comments of Texas Instruments, Inc. at 11-14.

sharing rules. As Motorola argued in its Comments, such consideration is consistent with the Commission's policy of favoring both total and partial private settlements. This pro-settlement policy should weigh all the more prominently where, as here, the Commission has correctly proposed the adoption of a settlement agreement and is now confronted with the criticisms of one party to that agreement, which would naturally prefer a "better deal" for itself.

TI, like CellularVision, agreed to the sharing plan set forth in the NRMC Agreement, whereunder LMDS providers would be able to operate in the 29.1-29.5 GHz band subject to certain restrictions, including the critical prohibition on subscriber-to-hub links in that spectrum. The Commission adopted the basic provisions of this NRMC Agreement as a proposal in the NPRM, except that it proposed to give LMDS operators access to even more unencumbered spectrum than the amount to which they had agreed. TI now seeks to retain the benefits of the settlement agreement, and the extra benefit of additional unencumbered LMDS spectrum proposed in the NPRM, while extricating itself from the most important restriction to which it agreed in order to secure these benefits. Conversely, it would hold Motorola to its commitment to sharing with LMDS operators without granting it the fundamental restriction that is critical to making such sharing possible for Motorola. The Commission cannot countenance such "cherry-picking" of the benefits of a settlement agreement by one of the settling parties.

2. The Methods Suggested For Accommodating LMDS Subscriber Traffic Are Based On Faulty Assumptions And Are Infeasible Or Insufficient

TI, along with Hewlett-Packard ("HP") and others, contends that subscriber transmissions in the spectrum shared by LMDS and MSS will not hamper

the operation of MSS feeder links.[4/] This contention is technically unsound. It is based on a series of faulty technical and behavioral assumptions which, even if they could be imposed as rules, would likely not only impede the optimal operation of the MSS feeder links, but also of the LMDS service providers themselves.

TI does not proffer any evidence that sharing between MSS feeder links and LMDS subscriber links is feasible. It merely claims that sharing can be "facilitated" by a list of "items." The mere assertion that certain items could "facilitate" sharing is not a sufficient guarantee that sharing will be possible. In any event, the "items" listed by TI are unreliable, impossible to implement and insufficient to guarantee such sharing.

TI first suggests that sharing can be achieved by case-by-case coordination. Yet one of the primary objectives of the negotiated rulemaking process was to develop sharing rules that would eliminate the need for such coordination. The proposed rules § 21.107, § 21.1002, and § 21.1018 to § 21.1022 satisfy this goal only for sharing between MSS feeder links and LMDS hub traffic. This was also the rationale underlying Motorola's request for a restriction on LMDS subscriber-to-hub links in those negotiations. Since it was not possible to devise reasonable sharing constraints, Motorola could not entrust the uninhibited operation of the IRIDIUM® System to case-by-case coordination with millions of LMDS subscriber terminals throughout the country. Coordination with each individual operator that could produce interference into the IRIDIUM® uplinks, without any specific technical constraints and without criteria on which to base such coordination, would effectively make the spectrum unusable for Motorola.

[4/] See e.g., Comments of Texas Instruments at 7-8 & 12-13; Comments of Hewlett-Packard at 4-5

TI also suggests that MSS feeder link antennas could use a minimum elevation angle of 10 degrees in order to facilitate sharing. As Motorola demonstrated in its Comments, increasing the IRIDIUM® System's minimum elevation angle from 5 to even 7 or 8 degrees would compromise the link acquisition process for the IRIDIUM® System and would be ineffectual in avoiding harmful interference into the satellites.[5/]

TI also suggests that sharing will be "promoted" if: 1) LMDS operators use active power control to minimize radiated power; 2) LMDS subscriber equipment is implemented with transmitter interlocks and receive an enabling signal from the hub before allowing the CPE return link transmit function and 3) CPE transmitter power is not more than 100 milliwatts, antenna gains are less than 36 dB, antenna beamwidths are between 2 to 5 degrees and sidelobes are greater than 22 dB.[6/] TI has not, however, proposed these as technical constraints, but even if it had they would not be sufficient to protect MSS feeder link operations. In particular, such constraints, even if implemented, would not address the fundamental problem of sharing between LMDS subscriber traffic and MSS feeder links, namely, the number of LMDS antennas within the satellite footprint. TI's suggestions place no limit on how many subscribers can be transmitting within the footprint of the satellite.[7/] Indeed, in any event it would be exceedingly difficult to ensure compliance with such a limit in light of the anticipated number of LMDS subscribers.

5/ Comments of Motorola at 6 and App. 1.

6/ Comments of Texas Instruments at 8.

7/ An upper limit on the number of hub transmitters is one of the primary (although not exclusive) constraints by which Working Group 2 of the NRM was able to develop technical constraints for hub transmissions. Other criteria for sharing between feeder links and hub-to-subscriber traffic were that the hub antennas would be omni-directional and primarily pointing down, and that the transmitting equipment would be under the control of the licensed operator.

Moreover, even if the factors suggested by TI could be translated into practicable rules, other LMDS operators and prospective LMDS suppliers may be unwilling or unable to comply with them. One of the most significant problems with LMDS subscriber transmissions is the lack of uniformity in the systems and business plans of members of the LMDS industry, a characteristic that is reflected in their Comments in this proceeding. Of course, the eventual emergence of dozens of LMDS licensees will likely bring about even greater diversity and technical variation among their systems, which will make it even less likely that uniform sharing criteria can be developed.

The TI subscriber sharing analysis uses the most optimistic technical assumptions to produce the slimmest of margins, while at the same time rejecting any notion of imposing technical constraints upon the LMDS proponents. The advocates of LMDS have failed to translate any of their assumptions into technical constraints and have even rejected the recommendations of the NPRM regarding transmitter power (-52 dBW/Hz).[8/]

For example, both TI and Hewlett Packard attempt to relate the EIRP Spectral Area Density for a collection of subscribers to the limit proposed for LMDS hubs. In Part 2 of TI's Appendix A, TI presents an analysis for meeting the 0° elevation Power Spectral Density (-26 dBW/MHz-km^2) with subscribers pointing above the horizon. The transmitter EIRP Spectral Area Density Limit of § 21.1021, however, must be calculated using both Table 1 and Table 2. Consequently, TI has evaluated its subscriber EIRP Spectral Area Density Limit against the wrong limit. The correct limit was derived for hubs and, at 2.5°, is approximately 25 dB lower than assumed by TI in its analysis.

8/ TI's Comments at 12 ("we recommend that the restriction of proposed rule § 21.107 be removed in favor of coordination . . .") (Sept. 7, 1995).

In its comments, HP also attempts to relate the EIRP Spectral Area Density for hubs (§ 21.1020 and § 21.1021) to subscriber transmissions in the shared band. The analysis calculates an EIRP Spectral Area Density at two elevation angles (0° and 7.5°) from the subscribers. HP's interpretation of the results is that the subscriber EIRP Spectral Area Density is within the hub limit. HP fails to develop, however, a method for evaluating the aggregate interference. It is unclear whether the same levels of interference at the space vehicle would result from a collection of subscribers as used in HP's model for the hubs At a minimum, HP must outline a method for evaluating the subscriber interference with a rule similar to the one contained in § 21.1020 and § 21.1021. This would involve specifying the technical constraints and upper limits on numbers and deployment of subscribers for any assumptions used in the evaluation.

In summary, no LMDS proponent has proposed any technical rules for subscriber operation that would provide sufficient protection from wide area aggregate interference into an IRIDIUM® System feeder uplink or demonstrated that it would be possible to do so. Any proposal for coordination without technical criteria is completely unworkable.

3. The Prohibition On LMDS Return Links In 150 MHz Leaves The LMDS Industry Relatively More Unencumbered Spectrum Than The Commission's Original Proposal

In light of the serious interference problems posed by LMDS return links to MSS systems and the diversity that characterizes the LMDS industry, the prohibition on LMDS return links in the 29.1-29.25 GHz band is reasonable and should apply regardless of the licensing scheme ultimately adopted by the Commission. Contrary to the fears of some LMDS proponents, this restriction will not have the effect of limiting

the competitiveness of LMDS, nor will it reduce the value of the spectrum itself.[9/] Rather, this restriction leaves an ample 850 MHz of LMDS spectrum unfettered; this spectrum can be devoted to two-way LMDS traffic.[10/] Contrary to TI's claim, 850 MHz is more than ample spectrum to support two-way LMDS traffic.[11/] This is particularly true if LMDS operators employ time division duplexing instead of frequency division to coordinate forward and return transmissions.[12/] Indeed, such a technique would further the Commission's dual goals of supporting LMDS two-way traffic and encouraging the most efficient use of spectrum possible.

It must also be pointed out that the LMDS proponents had agreed to a prohibition on subscriber-to-hub transmissions in 400 MHz of spectrum, whereas the Commission's proposal would limit the scope of that prohibition to 150 MHz. CellularVision argues that LMDS proponents agreed to the restriction on 400 MHz at a time when the Commission was proposing to make 2000 MHz available for LMDS.[13/] Such a response falls short for at least two reasons.

9/ See e.g., Comments of Nynex at 4; Comments of Northern Telecom at 3; Comments of Hewlett-Packard at 3.

10/ Indeed, even a Commission decision to issue 150 MHz licenses would not hamper the LMDS industry. As Motorola pointed out in its Comments, such licenses might actually facilitate the business plans of bidders only interested in multichannel distribution programming, as they would not have to bid for spectrum which allows services they do not want to provide. Likewise, the potentially lower value of those licenses compared to the 27.5-28.35 GHz spectrum might entail lower prices to consumers that are only interested in receiving programming and would rather not pay for a service that they do not need. See Comments of Motorola at 7-8.

11/ Comments of TI at 7.

12/ In frequency division, an operator simply divides up the available spectrum between forward and return transmissions. In time division duplexing, an operator transmits part of the time from hub-to-receiver and part of the time from receiver-to-hub. This is an extremely flexible technique which allows an operator to make efficient use of the spectrum based on a particular market's needs.

13/ Comments of CellularVision at 4.

First, the 2000 MHz would have been split between two LMDS licensees, each getting access to 1000 MHz. While the Commission's current proposal would make a total of 1000 MHz available to LMDS, it contemplates that one licensee may be assigned the full 1000 MHz.[14/]

Second, the licensee in the 28.5-29.5 GHz band under the Commission's original proposal would have been subject to the return link prohibition in 40% of its assigned spectrum (*i.e.*, 400 MHz out of 1000 MHz). Thus, even if the Commission splits the 1000 MHz that would be designated for LMDS under its proposed band plan between two LMDS licensees, and the full 150 MHz of shared spectrum is split between the two LMDS licensees, each LMDS licensee would have only 30% of its spectrum encumbered (*i.e.*, 75 MHz out of 500 MHz) -- even less than what the LMDS proponents had originally agreed to.

Indeed, even at 40%, the return link prohibition is really no encumbrance at all because LMDS proponents believed then that, given the small amount of subscriber-to-hub traffic relative to hub-to-subscriber traffic, having the ability to operate return links in 60% of their assigned spectrum was more than sufficient to meet their needs. They have given no reason now why having that ability in at least 70% of their assigned spectrum is insufficient.

B. There Is No Basis For Modifying The Proposed MSS/LMDS Sharing Rules By Requiring That MSS Systems Increase Their Uplink Power

Endgate Corporation argues that LMDS operators would have more operational flexibility if the EIRP of NGSO MSS feeder uplinks were 10 to 15 dB higher than that proposed for the IRIDIUM® System.[15/] As Motorola has previously responded when Video/Phone Systems, Inc. raised the same argument during and after the 28

[14/] See NPRM at ¶ ¶ 78-81.

[15/] Comments of Endgate at 3-4.

GHz Negotiated Rulemaking, this request for an EIRP increase of 10 to 15 dB is completely arbitrary, because neither Video/Phone nor Endgate has ever offered any substantiation for the reasons why such an increase would make any difference with respect to sharing with LMDS. Motorola repeatedly explained to Video/Phone during the 28 GHz Negotiated Rulemaking that, given the magnitude of the negative sharing margins, increasing earth station EIRP by 10 dB would not make any appreciable difference with respect to the feasibility of co-frequency sharing between the IRIDIUM® System and the LMDS system designs being advanced by Video/Phone. Specifically, Video/Phone did not then, and Endgate does not now, show how such an increase in power would overcome negative sharing margins for the Video/Phone LMDS system on the order of -25 dB (hub-to-satellite).[16/] In the absence of such a showing, any increase in earth station EIRP would be purely arbitrary. Indeed, rather than helping to facilitate co-frequency sharing in the 28 GHz band, increasing transmit power could actually make it more difficult to share by increasing the potential for interference from IRIDIUM® System earth stations to the other services operating in the band (*i.e.*, LMDS and FSS).[17/]

16/ See Report of Working Group 2 at 40-41 (Appendix 7 to Report of the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee). In contrast, the sharing margins for the other two systems analyzed during the 28 GHz NRM, those of Suite 12 Group/CellularVision and Texas Instruments, are positive. See Report of Working Group 2 at 36-39.

17/ Video/Phone has previously argued that the impact of increasing earth station transmit power can be limited to those geographic areas, such as the United States, where sharing with LMDS may be an operational requirement. It should be noted, however, that a U.S. earth station operating with increased transmit power could potentially affect terrestrial and satellite receivers outside the United States if the receiver is within line-of-sight of the earth station

C. The Data Submitted By TRW Support Motorola's Position That The Proposed Allocation For MSS Feeder Links Can Only Accommodate One MSS System

Motorola has consistently maintained that the proposed 150 MHz of shared MSS feeder uplink/LMDS spectrum and corresponding shared MSS feeder downlink/FS spectrum cannot accommodate on a co-frequency basis the day-to-day operations of more than one MSS system.[18/] The data submitted by TRW in this proceeding confirm, rather than contradict, this position. Indeed, while TRW states in its Comments that sharing between two NGSO MSS systems, such as the IRIDIUM® and ODYSSEY® systems, is possible, its own interference analysis clearly suggests otherwise.

TRW claims that sharing between the IRIDIUM® and ODYSSEY® systems is possible with geographic separation of feeder link earth station complexes and the use of opposite sense of polarization.[19/] TRW's own interference analysis shows, however, that such sharing is not feasible when the conclusions of that analysis are gauged against the appropriate interference threshold for the IRIDIUM® System.[20/] The short term aggregate interference threshold for the IRIDIUM® System is 0.79 Nt at 10% of the system unavailability requirement on a cumulative annual basis considering both the up and down links from all interfering systems The IRIDIUM® System availability requirement is 99.9%, which results in the interference threshold of $I \geq 0.79$ Nt for no

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18/ As Motorola explained in its Comments, it appears that existing Conference Preparatory Meeting ("CPM") studies cannot create the level of certainty necessary to accept co-frequency sharing of the feeder links of the IRIDIUM® system with the feeder links of another MSS system. See Comments of Motorola at 9-10.

19/ Comments of TRW at 17.

20/ Comments of TRW at Attachment I. TRW's analysis needs to be described in more detail for an objective examination to be conducted. Some of the items that need further study and description by TRW are: 1) input parameters, 2) time length of the simulation, 3) depolarization of the atmosphere at 28/19 GHz, and 4) a detailed description of the results shown in Figures 3-6 through 3-16 and Figures 3-17 and 3-18, together with their relationship to Tables 3-1 through 3-4.

more than .01% of the time. Interpolating from TRW's Table 3-2 for the two ground stations separated by 509 km (*i.e.*, San Luis Obispo, California and Las Vegas, Nevada), this interference criterion is not met, as the cumulative level of interference from TRW's feeder uplinks into the IRIDIUM® satellite receivers is approximately 2.2 Nt. Thus, TRW's own analysis shows that the addition of a second system in the 29.1-29.3 GHz bands would result in levels of interference to the IRIDIUM® System that far exceed the maximum amount the system can tolerate. The Commission should not try to accommodate two systems in the 29.1-29.3 GHz band with such crippling results for one of those systems. On the other hand, Motorola supports the accommodation of two MSS systems in 400 MHz of feeder link spectrum (subject to a restriction on the use of VSATs by FSS systems in the 29.25-29.5 GHz band).[21/]

1. Even If It Were Feasible, Sharing With TRW In The 29.1-29.3 GHz Band Would Require Identification Of Additional Gateway And Earth Station Complexes For The Second MSS Operator

As noted by both Motorola and TRW in their Comments, the NRMC Agreement between Motorola and the LMDS interests contemplates the feeder link and gateway location needs of only one MSS system -- the IRIDIUM® System.[22/] Accordingly, accommodating one more MSS system would require revisions to proposed rules § 25.257 and § 21.1002(c)(2). As TRW correctly points out, Motorola expects to construct gateway and satellite control stations at six of the eight selected sites in the United States.[23/] TRW proposes rules, however, that would compromise Motorola's flexibility in choosing sites by constraining Motorola to only one site from each category of MSAs and holding up Motorola's ability to choose a further site until

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21/ See Comments of Motorola at 11-15 for a discussion of why such a restriction on VSATs is imperative.

22/ Comments of TRW at 19.

23/ Id. at 19.

TRW is given a preemptive opportunity to choose a site in the same category.[24/] Accordingly, Motorola cannot agree with TRW's proposed § 25.257(a)(4).

The general scheme suggested by TRW, whereby Motorola would choose eight locations and use only six while TRW would choose the remaining two, transcends the letter but not necessarily the spirit of the Motorola/LMDS Agreement. Motorola, of course, cannot know whether such a scheme would be acceptable to the LMDS interests. Motorola believes, however, that it should not entail an excessive or unreasonable extra burden on LMDS operators since the aggregate number of Big LEO MSS sites would remain the same as under the NRMC Agreement. However, Motorola notes that TRW's proposal to elevate one complex from MSAs 51 - 100 to MSA 26 - 50 (thus allowing two complexes in MSAs 26 to 50), may raise objections from LMDS interests.

D. Sharing Between FSS And MSS Is Not Possible Unless The Commission Restricts FSS Operations In The Shared MSS/FSS Spectrum To A Limited Number Of Large Terminals And Bans FSS Operations Near All Potential SCS Locations

The NPRM proposed co-primary sharing between MSS feeder link operations and GSO FSS in the 29.25-29.5 GHz band for the uplinks, and possibly in the 19.3-19.425 and 19.575-19.7 GHz bands for the downlinks. In response to this proposal, Motorola argued that such sharing would be extremely problematic, and would be feasible only if GSO FSS operators were restricted to a limited number of large terminals in that part of the GSO FSS allocation. To analyze MSS feeder link-GSO/FSS sharing, Motorola proposed a short-term interference criterion for

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24/ See Comments of Motorola at 10-11 for a discussion of the marketing and operational factors that underlie its need for flexibility in locating gateway sites. In addition, Motorola does not believe that it would be unreasonable to increase the number of protected feeder link sites above eight because the amount of affected LMDS spectrum would be only 150 MHz as opposed to the 400 MHz contemplated in the Agreement.

IRIDIUM®-type feeder links. On the basis of this criterion Motorola performed sharing studies between different types of GSO systems and an IRIDIUM®-type system. See Appendix B to Motorola Comments. The conclusion of these studies was quite clear: that co-frequency, co-location sharing with VSAT networks was not possible. For some non-VSAT GSO FSS configurations, geographic separation coupled with other techniques (such as power control) provided the necessary mitigation.

In its Comments, Hughes concludes that sharing is not possible without vast exclusion zones separating IRIDIUM® or ODYSSEY®-type terminals from Spaceway™ earth terminals. This conclusion is generally consistent with Motorola's analysis. Unfortunately, Hughes' analysis does not provide details allowing Motorola or the FCC to determine which class of GSO earth stations or which spot beams on the GSO spacecraft require such large exclusion zones, or whether such zones are necessary for the uplinks or the downlinks. Nonetheless, and despite this absence of detail, Motorola believes that Hughes' analysis supports Motorola's conclusion -- that these serious interference problems can only be alleviated by the restrictions and mitigation techniques recommended in Motorola's Comments.[25/]

While Motorola, thus, agrees in principle with Hughes' analysis, it strongly disagrees with one of the two alternatives recommended by Hughes -- relegating the IRIDIUM® feeder uplinks to reverse band working. As for the other alternative -- the band segmentation plan suggested by Hughes -- such a plan would not appear to present any serious problems for the IRIDIUM® System. Accordingly, Motorola would be able to accept such a solution if it were presented in a vacuum or on a clean slate. In the current reality of this proceeding, however, Motorola fears that Hughes' alternative band plan will be unacceptable to the LMDS interests.

[25/] These sharing issues have become even more problematic with the recent Ka-band applications filed in response to the Commission's Public Notice: Ka-band Satellite Applications Accepted for Filing, DA No 95-1689 (July 28, 1995).

1. A Requirement Of Reverse Band Working For The IRIDIUM® Uplinks Could Have A Catastrophic Impact On The IRIDIUM® System

As Motorola demonstrated in its Comments, its choice of the 29.1-29.3 GHz band for the IRIDIUM® uplinks was far from arbitrary. Motorola selected this uplink spectrum, as well as its pairing with the 19.4-19 6 GHz downlink band, based upon efficient system design considerations as well as the ability to minimize the coordination problems that a worldwide system would inevitably confront. The choice proved prescient, as the Commission has been able to achieve substantial progress in coordinating the IRIDIUM® System with other countries. This progress would be wasted, and Motorola would need to embark on an expensive redesign of the IRIDIUM® System, if Motorola now had to use and coordinate the 19.4-19.7 GHz band in Reverse Band Working ("RBW"), as Hughes suggests.

Even setting the redesign and wasted coordination issues aside, the question of whether IRIDIUM®-type uplinks can share the 19.4-19.7 GHz band in RBW mode with other primary allocations, including GSO uplinks and the Fixed Service, is still very much an open one The only technical studies to support MSS feederlink sharing by RBW in the Ka-band were submitted by TRW to the Industry Advisory Committee and Canada. These studies only considered sharing between one MSS RBW feederlink and one GSO system. While the RBW uplink bands recommended in the IAC final report were 18.4-18.6 and 18.8-19.7 GHz, no specific downlink band was identified. The CPM noted that downlinks at 29 GHz were impractical. Therefore, further studies are required to take into account the GSO technical characteristics on a specific downlink band below 17.7 GHz that would support 300 MHz.

It should further be noted that additional studies at the CPM suggested that the RBW of MSS networks with GSO networks be largely restricted to bands lightly used by GSO networks The recent large number of GSO filings in the Ka-band

suggest that this band will not be "lightly used" by the GSO community and many proponents are considering the use of a multiplicity of VSAT terminals. Therefore, the FCC should consider the 18.1-18.55 GHz band as a RBW candidate, since it would be orphaned with the LMDS 27.5-28.35 GHz allocation Further studies are required to identify an appropriate downlink band with a low population of GSO terminals around the world. The RBW operation of uplinks in the 19 4-19.7 GHz band would also require coordination with the terrestrial Fixed Service operators in a band rapidly becoming populated with such operators.

Additionally the proposal that two MSS Ka-band networks could share the same frequencies in the RBW mode has not been supported by technical studies. The co-frequency sharing study between two MSS Ka-band networks as submitted by TRW in its initial Comments suggests that this proposal is extremely problematic, as extensive mitigation would be required.

In any case, it would be entirely unreasonable to require Motorola to change the IRIDIUM® System design to RBW at this late date. The initial selection of the IRIDIUM® System's up link and down link frequencies has facilitated the formidable global coordination process, and switching to an unproven method of sharing would cause a catastrophic deployment delay.

2. The Alternative Plan Proposed By Hughes, While Acceptable To Motorola, May Create Serious Problems For LMDS Interests

As an alternative to the Commission's proposal and to its own sharing suggestions, Hughes also proposes the following band plan, which, while it eliminates the extreme difficulties involved in sharing between MSS feeder links and FSS, could be seen by the LMDS interests as increasing their burden:[26/]

26/ Comments of Hughes at 22-24.

HUGHES ALTERNATIVE BAND PLAN

27.5	28.0	28.5	29.0	29.5	30.0
LMDS fss 500 MHz	GSO/FSS ngso/fss 500 MHz	NGSO/FSS gso/fss 500 MHz	MSS FEEDERLINKS LMDS 500 MHz	GSO FSS ngso/fss 500 MHz	

This band plan, with minor modifications, offers significant advantages for satellite interests, as it will avoid the unresolved GSO FSS and NGSO MSS feeder link sharing issues discussed above and will accommodate the feeder link requirements of more than one MSS system. The plan will also provide an additional 100 MHz for feeder link needs. However the plan will likely be viewed by LMDS interests as posing significant problems for LMDS, as it would reduce the largest contiguous portion of LMDS spectrum to 500 MHz and would necessitate extending the subscriber-to-hub transmission prohibition to an additional 350 MHz of spectrum. For these reasons, Motorola doubts that the LMDS interests will consider this alternative band plan a viable solution.

E. The Commission Correctly Proposes To Remove The MSS Allocation From The 29.5-30 GHz Band

Motorola agrees with the proposal to eliminate the MSS allocation in the 29.5-30.0 GHz band, where there are currently no operational MSS systems.[27/] The MSS allocation in that band resulted from decisions made at WRC-92. Recommendation 719 urged that the sharing between FSS and MSS in these bands be examined as a matter of urgency. This examination was conducted by ITU-R Working party 4A in the ITU-R Study Group 4 in accordance with Question ITU-R 81-4, and resulted in a Preliminary Draft New Recommendation, which illustrates the significant

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27/ NPRM ¶ 67.

difficulties posed by FSS and MSS sharing in the 29.5-30 GHz band. The identification of these difficulties support the removal of the MSS allocation. Such removal would make the 29.5-30 GHz spectrum more "FSS-friendly" and would provide assurance to FSS GSO network proponents that the allocation can be developed without need for the costly, time consuming activities that would be required to coordinate with an MSS system. In addition, removal of the MSS allocation would make it possible to accommodate more FSS systems in the available GSO arc, and thereby ensure availability of sufficient orbital positions to accommodate all domestic proponents of such systems.

The companion downlink allocation to 29.5-30 GHz is 19.7-20.2 GHz. Naturally, any changes made to the 29.5-30 GHz band should also be considered for the downlink allocation.

F. The Commission Should Not Allocate Spectrum To Fixed Services In The 29.1-29.3 GHz Band

Both the Commission in its NPRM and the Telecommunications Industry Association ("TIA") in its Comments have suggested allocating 28 GHz spectrum to fixed services ("FS"). These proposals present extremely serious interference problems for MSS feeder links, and should not be adopted by the Commission.

The Commission's NPRM suggested that FS entities might apply for LMDS spectrum themselves or lease spectrum from LMDS operators "to the extent permitted by our rules."[28/] Motorola assumes that these "rules" are those necessary for LMDS operators to maximize usage of their spectrum and not the sharing rules developed during the negotiated rulemaking to facilitate sharing between the LMDS hubs with backbones and the MSS feederlinks (*i.e.*, § 21.1018 through § 21.1021).

28/ NPRM at ¶ 53.